

**METHODS FOR FORMING A CAPACITOR ON AN INTEGRATED CIRCUIT
DEVICE AT REDUCED TEMPERATURES**

ABSTRACT OF THE DISCLOSURE

Methods of forming a capacitor on an integrated circuit include forming a lower electrode of the capacitor on an integrated circuit substrate. A protection layer is formed on the lower electrode at a temperature below a minimum temperature associated with a phase change of the lower electrode.

- 5 A dielectric layer is formed on the protection layer. The protection layer is configured to limit oxidation of the lower electrode during forming of the dielectric layer. An upper electrode of the capacitor is formed on the dielectric layer.